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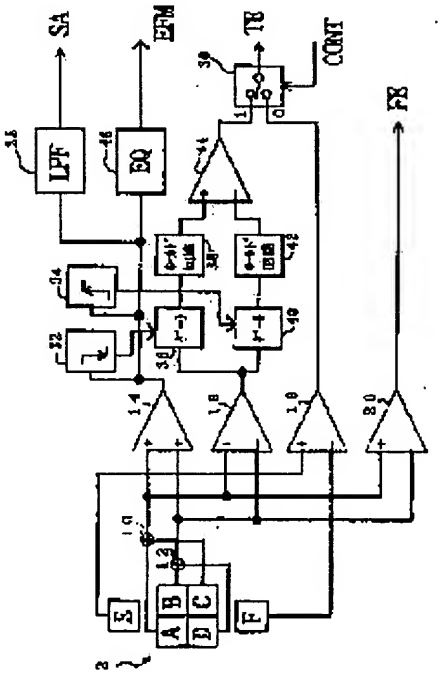
(54) OPTICAL DISK REPRODUCING DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide an optical disk reproducing device for reproducing the optical disk having the additive function such as the protection of copyright or the permission of selective reproduction of the recorded information by using the so-called BCA.
SOLUTION: The control information at the time of reproducing the main information is preliminarily recorded as the bar code on the BCA 9 for the auxiliary information recording part provided on the innermost peripheral part 1S of the optical disk, and the main information is reproduced based on this reproduced information. On plural tracks 8A-8E arranged on the BCA, the address recording areas 76 for the amount of at least one sector are remained, then the exact tracking servo control is performed by reproducing the address at the time of reproduction.



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CLAIMS

[Claim(s)]
[Claim 1]Optical recording of the main information characterized by comprising the following is carried out along a track of a concentric circle or spiral shape, And supplementary information is recorded on an optical recording portion divided into two or more sectors of two or more tracks near the most inner circumference of said track as a bar code in piles, And said bar code sees from a center of rotation of an optical disc, and it is arranged in an annular portion covering 360 degrees, And an optical disk reproducing device which irradiates with an optical beam said optical disc arranged among said two or more sectors in said annular portion by portion except at least one sector, and detects the catoptric light or transmitted light.
A means to move an optical beam to a focusing direction.
A means to distinguish a kind of said optical disc from a signal acquired by optical beam during said movement.
A means to set a parameter according to a kind of said optical disc from said discriminated result.
A means to judge existence of said bar code, a means to move an optical beam to a record section of said bar code when there is said bar code, a means that reads said bar code, and a means to perform reproduction of said main information according to said supplementary information currently recorded as said bar code.

[Claim 2]Optical recording of the main information characterized by comprising the following is carried out along a track of a concentric circle or spiral shape, And supplementary information is recorded on an optical recording portion divided into two or more sectors of two or more tracks near the most inner circumference of said track as a bar code in piles, And said bar code sees from a center of rotation of an optical disc, and it is arranged in an annular portion covering 360 degrees, And an optical disk reproducing device which irradiates with an optical beam said optical disc arranged among said two or more sectors in said annular portion by portion except at least one sector, and detects the catoptric light or transmitted light.
A means which reads an address from said sector.
A means which reads said supplementary information using said address.
A means to reproduce selectively information by which a reproducing permission is carried out among said main information according to said supplementary information.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]Especially this invention relates to the optical disk reproducing device with which supplementary information other than main information plays the optical disc currently recorded as a bar code.
[0002]
[Description of the Prior Art]In the conventional CD and especially CD-ROM, it is possible for physical restriction not to be provided by many except for legal restriction about read-out or re-recording of record data, to repeat all the data, to play, once an optical recording medium comes to hand, or to carry out re-recording to other recording media. In the optical disc for games, as a special WOBBU ring bit is formed in the most-inner-circumference part of an optical recording portion and it can play only with the playback machine of exclusive use [a special code], copyright protection is planned.
[0003]
[Problem(s) to be Solved by the Invention]By the way, when the storage density of an optical recording medium becomes high and data compression technology progresses, It is possible to be able to record now very a lot of data, and to record about 4.7 GB of data on the disk of one sheet, for example with DVD (digital videodisc: digital versatile disc). Various information, including a sound, a still picture, an animation, a game program, a computer program, etc., is recorded on an optical recording medium by what is called multimedia-ization, and is provided by it.
[0004]However, the policy for enabling copyright protection of the record data of an optical recording medium, reproduction of record data, and alternative permission of re-recording was not fully taken until now. In the technique of limiting to playback by an exclusive player like the disk for games, it cannot be said that it is inconvenient from the field of use of an optical recording medium, and suitable for DVD or DVD-ROM. Therefore, record to the optical recording medium of the information and data in which the record data of an optical recording medium has protection value indefinitely since re-recording will be carried out, reproduction and may waver.
[0005]Therefore, besides the main information by which this invention was recorded on the optical disc as light information, . Are known as a recording part by the bar code provided in order to record supplementary information on the inner circumference portion of an optical disc. It aims at providing the optical disk reproducing device which plays the optical disc which has additional functions, such as protection of copyright, and selective reproduction permission of recorded information, using what is called BCA (burst cutting area).
[0006]
[Means for Solving the Problem]In order to attain the above-mentioned purpose, this invention provides an optical disk reproducing device which has the composition of following (1) and (2).
(1) Optical recording of the main information is carried out along a track of a concentric circle or

spiral shape, And supplementary information is recorded on an optical recording portion divided into two or more sectors of two or more tracks near the most inner circumference of said track as a bar code in piles, And said bar code sees from a center of rotation of an optical disc, and it is arranged in an annular portion covering 360 degrees, And said optical disc arranged among said two or more sectors in said annular portion by portion except at least one sector is irradiated with an optical beam, A means to be an optical disk reproducing device which detects the catoptric light or transmitted light, and to move an optical beam to a focusing direction, A means to distinguish a kind of said optical disc from a signal acquired by optical beam during said movement, A means to set a parameter according to a kind of said optical disc from said discriminated result, a means to judge existence of said bar code, and when there is said bar code, An optical disk reproducing device by which it is characterized [which has a means to move an optical beam to a record section of said bar code, a means which reads said bar code, and a means to perform reproduction of said main information according to said supplementary information currently recorded as said bar code].
(2) Optical recording of the main information is carried out along a track of a concentric circle or spiral shape, And supplementary information is recorded on an optical recording portion divided into two or more sectors of two or more tracks near the most inner circumference of said track as a bar code in piles, And said bar code sees from a center of rotation of an optical disc, and it is arranged in an annular portion covering 360 degrees, And said optical disc arranged among said two or more sectors in said annular portion by portion except at least one sector is irradiated with an optical beam, A means which is an optical disk reproducing device which detects the catoptric light or transmitted light, and reads an address from said sector, An optical disk reproducing device having a means which reads said supplementary information using said address, and a means to reproduce selectively information by which a reproducing permission is carried out among said main information according to said supplementary information.
[0007]
[Embodiment of the Invention]Hereafter, with reference to drawings, it explains with an example desirable about an embodiment of the invention. Drawing 1 is a schematic plan view of an optical recording medium. Drawing 2 is a figure showing the head part and tail part of BCA9 provided in the optical recording medium. BCA9 is provided in the most-inner-circumference part 1S of the optical recording portion 1R of the optical disc 1 as an optical recording medium. In the inside 8A, 8B, 8C, 8D, and 8E of a figure, five tracks of spiral shape or concentric circle shape established in the most-inner-circumference part 1S of the optical disc 1 are shown. these five tracks -- vertical -- namely, the optical disc 1 -- radially -- and each bar of BCA9 is provided so that these five tracks may be crossed. Five or more BCA9 can be actually provided, for example over tens of tracks. When the optical disc 1 is manufactured [9 / BCA], after the track of the optical recording portion 1R is formed in La Stampa, Ranging over two or more tracks of the most-inner-circumference part 1S of a track, burn off the reflection film of a disk selectively by high output laser, such as an YAG laser, and it removes, A bar code is formed in the circumferencial direction of an optical disc, and it is also called burst cutting area or PCA (post cutting area). BCA9 differs from the track of the usual optical recording at the point which can record respectively peculiar information about every sheet of the disk manufactured by Stamping in large quantities. As data volume, it is about 180 bytes in 1 round.
[0008]the portion 72-1 shown black in drawing 2, 72-2, and 72-3 ... is the portion from which the reflection film of the optical disc was removed -- the portion 74-1 between these, 74-2, and 74-3 ... is a portion from which the reflection film is not removed. the portion 72-1 from which this reflection film was removed, 72-2, and 72-3 -- the portion 74-1 which calls ... a black bar portion and from which the reflection film is not removed, 74-2, and 74-3 ... is called white bar. The pitch of the black bars which adjoin each other along with the circumferencial direction (longitudinal direction shown by an arrow among drawing 2) of a track is 1T, 2T, or 3T. 1T is the circumferencial direction length of one sector, and if it sees about 1 round near most-inner-circumference part 1S of the optical recording portion 1R of the optical disc 1, the portion 75 in which the black bar is not

provided exists covering a length of one or more sectors. In each of two or more tracks in which a bar code is provided, this is for being left behind in a form with at least one perfect sector 76, and reproducing an address and a synchronized signal from there. Although the field in which a black bar is not provided is minimum 1 sector, in order to be exact decoding of an address, it is desirable to exist by 16 sectors which constitute 1 ECC block.

[0009]Drawing 3 shows one mode of the optical recording medium with which BCA is provided in two fields, respectively. Among these, as for one BCA, a bar code is provided at the time of manufacture of the optical disc 1, and other one is for a user to record an after-purchase bar code for the optical disc 1. Namely, the 1st bar code 77 sees from the center of rotation of the optical disc 1, and it is arranged in the 1st annular portion 78 covering 360 degrees, the [and] -- being arranged among two or more sectors in the 1 annular portion 78 by the portion except at least one sector 76A -- further -- the -- the [which has at least one sector 76B for newly adding the 2nd bar code 79 to the radial inside or outside of the 1 annular portion 78] -- there are the 2 annular portions 80.

[0010]BCA in this 1st annular portion 78 is provided at the time of manufacture of the optical disc 1, and is prima starred (preformat) area. On the other hand, the area where the bar code of the 2nd annular portion 80 is recorded is postscript area. Although the state where the bar code 79 was already recorded on the postscript area of the 2nd annular portion 80 is shown by drawing 3, since the bar code 79 is not recorded at the time of manufacture, it is not a black bar of the 2nd annular portion 80 at this time. When it sees in the direction of signal regeneration of the optical disc shown in drawing 3 by an arrow, it is a desirable mode that the bar code 77 is arranged from immediately after at least one sector 76A of the 1st annular portion 78.

[0011]Drawing 4 shows other modes of the optical recording medium with which two BCA(s) as prima starred area and postscript area are provided in two fields, respectively. Namely, it is arranged by the portion 82 to which the 1st bar code 81 saw from the center of rotation of an optical disc, and the annular portion covering 360 degrees was restricted, And the inside of the sector of the plurality [bar code / this / 81 / 1st] in an annular portion, When it is arranged by the portion except at least two sectors 76C and 76D and sees to a circumferencial direction, the two sectors 76C, It is arranged between 76D and has the postscript portion 84 for newly adding the 2nd bar code 83 to the portion except the 1st bar code 81 and at least two sectors 76C and 76D among the annular portion further.When it sees in the direction of signal regeneration of the optical disc shown in drawing 4 by an arrow, it is a desirable mode that the bar code 81 is arranged from immediately after [of the two sectors 76C and 76D] one.

[0012]Various information is recordable on two BCA(s) shown in BCA, drawing 3, or drawing 4 shown in drawing 2. That is, one or more of user specification information, rental information, area designation information, language specification information, use specification information, estimated usable period specification information, the number-of-times specification information of usable, usable player specification information, resolution specification information, and layer specification information are recordable as a bar code. One or more of owner-of-a-copyright information, copyright number information, manufacturing date information, maker information, sales day information, information storing, seller information, product user information, use number information, and operating set number information are recordable on these BCA(s) as a bar code.

[0013]It is provided, recorded BCA, i.e., the prima starred area, like drawing 2, and control in an optical disk reproducing device is performed by the above-mentioned information recorded at the time of manufacture when there was no postscript area. On the other hand, in the case of the optical recording medium which has postscript area in addition to prima starred area, it can use as follows. Now, 100 game software for computers shall be beforehand recorded noting that an optical disc is DVD. Among these, those who purchased this DVD shall use only ten software unconditionally, and only after the 90 remaining software pays a predetermined fee, it shall be used for it. In order to permit use on condition of the payment of this fee, a DVD buyer pays a fee for

software [there is a predetermined bar code writing device after purchasing DVD, for example] to go to shop fronts, such as a convenience store, and use, and has a predetermined bar code recorded on postscript area after that.

[0014]When the royalty which paid the fee and which receives soft is granted and a user reproduces that DVD with his own DVD player by record of the predetermined bar code to this postscript area, the software which was not able to be enjoyed can be enjoyed before fee payment. That is, an optical disk reproducing device reads the bar code recorded on postscript area in the agency which paid the fee, and reproductive permission is given. Although the above-mentioned explanation explained the case where soft use was only permitted by the payment of a fee, according to the contents of the above-mentioned recorded information, such as the expiration date, a use count, and language specification, various restrictions can be added to the mode at the time of reproduction, or it can perform selection.

[0015]Next, the optical disk reproducing device of this invention which reproduces the above mentioned optical recording medium is explained. Drawing 5 is a block diagram showing one example of the optical disk reproducing device of this invention. This optical disk reproducing device plays CD and DVD to only for [playback] type information, and a two-layer [only for playback] type thing, a write once type thing, and a record reproduction type thing are contained as a DVD. Drawing 6 is a circuit diagram showing the arithmetic unit (some preamplifiers of drawing 5) which answers the optical pickup (PU) and output signal in drawing 5, and shows the example of a circuit which chooses one side of two kinds of tracking error signals according to the discriminated result of the kind of disk.

[0016]In drawing 5, control is performed by Motor Driver / tracking focus control circuit 4 so that the disk 1 may rotate by CLV (constant linear velocity) by the spindle (SP) motor 3 at the time of ordinary reproduction. The signal read by the optical pickup (optical head) 2 from the disk 1 is supplied to the preamplifier 5, and the output signal is given to the digital-servo control circuit 6. The system controller 7 performs transfer of the preamplifier part 5 and the digital-servo control circuit 6, and a signal, and controls the whole optical disk reproducing device. The output signal of the digital-servo control circuit (DSV) 6 is supplied to Motor Driver / tracking focus control circuit 4, and performs the roll control of the spindle motor 3, tracking servo control of an optical pickup, and focus servo control. DSV6 also has a function which sends out a regenerative signal other than a servo control circuit using the memory of a graphic display abbreviation including an adjustable-speed controller / memory controller / EFM demodulator circuit / error correction circuit. The disk 1 of the optical pickup 2 is movable radially at the traverse motor of a graphic display abbreviation, It is movable to the direction to which an object lens was along a focusing direction, i.e., an optical path, with the focus servo control mechanism and tracking-servo-control mechanism of a graphic display abbreviation, and the radial direction of a disk.

[0017]The optical pickup 2 has again a laser diode which irradiates the disk 1 with a laser beam, Output the signal which played the optical information recorded on the disk 1 based on the catoptric light, or, Two kinds of signals E and F for tracking error signal detection, signal A-D and the 3 beam method, which are the objects for focus error signal FE detection by astigmatic method as shown in drawing 6, and are also the objects for tracking error signal detection by a phase contrast method are outputted. These signals are supplied to the preamplifier 5 and a required operation is performed.

[0018]Drawing 6 shows the arithmetic unit which indicates typically the optical pickups 1 which have the photosensor portions E and F used for the 3 beam method to be the quadrisection photosensor portion A, B, and C and D, and answers the output signal from those photosensor portions. Numerals A-F shows the both sides of these photosensor portion and its output signal. The adding machine 10 of each other is added and outputs the output signal of the photosensor portions A and C on a diagonal line, the output signal of the photosensor portions B and D on other diagonal lines is added mutually, and the adding machine 12 outputs it. The adding machine 14 adds the output

signals of the adding machines 10 and 12, and both the subtractors 16 and 20 subtract the output signal of the adding machine 12 from the output signal of the adding machine 10. The subtractor 18 subtracts the output signal of the photosensor portion F from the output signal of the photosensor portion E. It rises with the falling pulse generating circuit 32 which answers the output signal of the adding machine 14, and the pulse generating circuit 34 is formed, and the gate circuits 36 and 40 controlled by these output signals, respectively carry out the gate of the output signal of the subtractor 16, and are given to the hold circuits 38 and 42, respectively. The output signal of the hold circuits 38 and 42 is given to + of the subtractor 44, and - input terminal, respectively, and the output signal of the subtractor 44 is given to 1 side-edge child of the switch 30. The output signal of the adding machine 14 is outputted as a sum signal (SA), an EFM signal, or an EFM plus signal respectively via LPF28 and the equalizer (EQ) 46, respectively. The output signal of the subtractor 18 is given to 0 side-edge child of the switch 30. Selected tracking error signal TE is outputted from the output terminal of the switch 30.

[0019]The control signal CONT given to the switch 30 controls the switch 30, chooses one side of the two input signals, and it is generated by the microcomputer of the system controller 7 so that it may mention later. The output signal of the subtractor 20 is given to a well-known focus servo control system so that it may be used as a focus error signal FE. Sum signal SA which is an output signal of LPF28 serves as a measuring object signal for the below-mentioned disk kind distinction while being a main signal for reading the recorded information on a disk. LPF28 is used in order to remove the high frequency component which may be contained in sum signal SA. Focus error signal FE is used for well-known focus servo control.

[0020]The system controller 7 distinguishes a disk kind by operation which the microcomputer (microcomputer) of a graphic display abbreviation mentions later. Although two kinds of tracking error signals can be switched by the result of the disk kind distinction by this invention and the 3 beam method and a phase contrast method can be properly used by CD with low storage density, and a disk with high storage density, The microcomputer in the system controller 7 generates the control signal CONT according to the kind of disk 1. That is, if it is judged that it is CD with low storage density, that the tracking error signal of the 3 beam method should be chosen, the switch 30 of drawing 6 will be connected to 0 sides, and the output signal of the subtractor 18 will be outputted. On the other hand, if storage density is judged to be a high disk, that the tracking error signal of a phase contrast method should be chosen, the switch 30 will be connected to 1 side and the output signal of LPF28 will be outputted.

[0021]Next, the thing of the two foci type as the optical pickup 2, i.e., JP,7-65407,A, The technique of distinguishing the kind of disk is explained using that whose correspondence on the disk which provides two convergent points in an object lens as shown in JP,7-98431,A, and with which thickness differs was enabled. At a spot (NA=0.38mm and NA=0.6mm), the optical pickup 2 shall read information from two kinds of disks, i.e., board thickness t1=1.2mm CD, and t2=0.6mm DVD. The distance between 2 foci shall be 0.3 mm. Since the abnormal conditions in a low frequency wave and the influence of offset will be received as influence of a disk surface if image formation is carried out simultaneously in a disk surface and a signal surface, the interval between 2 foci cannot be set up like the thickness of a disk.

[0022]Drawing 7 is a figure showing the condensing state of the laser beam to the disk 1 in this 2 focus type optical pickup. As for a t2=0.6mm disk and 1-c, one layer shows the condensing state to the two-layer type disk (interlaminar distance t3=40micrometer) which is 0.6 mm, the beam of the precedence upper part is an object for 1.2 mm, and the beam of the backward bottom of 1-a is [a t1=1.2mm disk and 1-b] an object for 0.6 mm. alpha, beta, gamma, and delta show each state where the object lens of the optical pickup 2 moved to the focusing direction, among drawing 7. Drawing 8 shows various signal wave forms obtained from an output signal when focusing search is performed by the optical pickup 2 corresponding to drawing 7. That is, the vertical axis of drawing 4 is voltage, a horizontal axis is time and p shows the peak. Since 2 focus type optical pickup comprises a

hologram lens, a signal is detected like JP,7-98431,A besides two spots of two foci, but signals other than 2 focus detection signals are omitted here.

[0023]Drawing 8 8-a - 8-d are drawing 7. To the disk of 1-a, 8-e - 8-h are drawing 7. To the disk of 1-b, 8-i - 8-l are drawing 7. The disk of 1-c is supported, respectively. Sum signal SA of drawing 6 is drawing 8. They are 8-a, 8-e, and 8-i, Focus error signal FE is drawing 8. They are 8-b, 8-f, and 8j, The signal acquired as a result of comparing sum signal SA with the threshold shown by a dotted line furthermore is drawing 8. The signal which were 8-c, 8-g, and 8-k, and was acquired as a result of comparing focus error signal FE with the threshold shown by a dotted line further is drawing 4. They are 8-d, 8-h, and 8-l.

[0024]By increasing or decreasing the voltage impressed to the focus coil of the optical pickup 2, focusing search is performed by making the object lens which is a part of optical system of the optical pickup 2 move in accordance with an optical path. Waveform of drawing 8 In 8-a, the peak of the left-hand side in a figure is drawing 7. It is obtained in the state of alpha of the disk of 1-a, and, similarly a right-hand side peak is acquired in the state of beta. Thus, the peak in drawing 4 corresponds to alpha of drawing 7, and beta, and is a waveform. Four peaks in 8-i - 8-l are drawing 7. alpha of the disk of 1-c, beta, gamma, and delta are supported. The portion which is crowded with thin lines among drawing 8 shows high frequency component HF.

[0025]According to the kind of disk distinguished so that it might mention later, the laser power of an optical head, The gain of the circuit which generates the focus error signal and tracking error signal in the preamplifier 5, A required parameter is set among items, such as the change of the characteristic of parameters, such as offset and balance, and the preamplifier 5 or the equalizer 46 in DSV6, i.e., the delaying amount of the unit delay element of the transversal filter which constitutes the equalizer 46, and tap gain setting.

[0026]The transversal filter which constitutes the equalizer 46 is a thing of structure as shown in drawing 10. The time delay T and the tap gains G0-G4 of the unit delay element which constitutes a transversal filter are controllable using the data beforehand memorized to program ROM of the controller of a graphic display abbreviation according to the kind of disk. In the case of 1.2-mm CD, in the case of 0.6-mm DVD, as an example of T, two for T= 80 ns can be switched for T= 440 ns. It is referred to as case G2=1 of 1.2-mm CD, G1=G3=0.12, and G0=G4=0 as an example of G0-G4, It is referred to as case G0=0.02 of 0.6-mm DVD, G1=0.2, G2=1, G3=0.2, and G4=0.02, and further, at the time of focusing search, in order to remove a frequency characteristic, it is made into G2=1, and it sets others to 0.

[0027]Drawing 9 is a wave form chart showing the focusing search in a two-layer disk, and shows the case where servo control is considered as one by the two-layer eye of a 0.6-mm disk. In drawing 9, 9-a is focus coil impressed electromotive force, and 9-b Sum signal SA, 9-c A ** focus error signal, the signal with which 9-d was obtained in sum signal SA as compared with the threshold, 9-e is a focus error signal. The signal acquired in 9-C as compared with the predetermined threshold, the signal with which 9-f is obtained by the comparator 50 in an EFM signal as compared with the reference value Ref, and 9-g are HFDET(s) (output signal of D-FF56) of drawing 11. Waveform Timing SC in 9-e shows the time of considering focus servo control as one.

[0028]Drawing 11 is a block diagram showing an example of a circuit which detects high frequency component HF using sum signal SA and an EFM signal among the output signal of the circuit of drawing 6. An EFM signal is given to the comparator 50 and compared with the reference signal Ref. Sum signal SA is given to D input of D-FF(flip-flop) 52, the Q output is given to D input of D-FF54 of the next step, the Q output is further given to D input of D-FF56 of the next step, and the Q output is outputted as the detecting signal HFDET. The output signal of the comparator 50 is given as a clock of each D-FF 52-56. Reset is a reset signal of each D-FF 52-56.

[0029]The output signal of the comparator 50 in the circuit of drawing 11, i.e., the signal after comparison of an EFM signal, is drawing 9. It is shown as 9-f. Signal which D-FF 52-56 shaped sum signal SA in waveform, and was made Only when 9-d is H (high-level), the pulse of the output signal

of the comparator 50 is counted, and if it counts three times, in this example, output signal HFDET 9-g of D-FF56 will be set to H. When it cannot count three times within this section, the counter which consists of D-FF 52-56 is reset by sum signal SA etc. Although it is considered as three counts in this example, this count number can be suitably made into the predetermined number of times.

[0030]Operation of composition of having combined drawing 6 and drawing 11 is explained. The spindle (SP) motor 3 is started after powering on of playback equipment, etc., and focusing search is started. That is, it is drawing 9 about the impressed electromotive force to a focus coil. It is made to increase little by little, as shown in 9-a, and the A/D conversion of the sum signal SA is carried out, it incorporates into a microcomputer, sum signal SA (9-b of drawing 9) is read, and the output signal HFDET of drawing 11 (9-g of drawing 9) is supervised simultaneously.

[0031]Signal acquired in comparison with a focus error signal (9-c of drawing 9), and a predetermined value by sum signal SA's exceeding a predetermined value, and setting the signal HFDET to H 9-e is supervised, focus servo control is considered as one by t (what is called an S curve in focusing search -- almost equivalent to a zero crossing point) the time of this being set to L (low level) from H. Many parameters of the playback equipment by the difference in the reflectance of each disk, for example, laser power of an optical head, The gain of the circuit which generates a focus error signal and a tracking error signal, offset, balance, the time delay of a unit delay element, a tap gain, etc. are set up, and regeneration is performed.

[0032]The operation is explained about the example of the above-mentioned optical disk reproducing device with the flow chart which comprises drawing 13 and drawing 14. When the power supply of playback equipment is switched on, it is exchanged in a disk or the data reproduction of other layers is called for by two or more layer type disk, this flow shall start. It initializes clearing the predetermined contents of the memory of a graphic display abbreviation and buffer which are first connected to the microcomputer etc. at Step S1, subsequently a spindle motor motor is started at Step S2, and an optical pickup (PU) is moved to the most inner circumference of a disk. Then, an optical pickup is moved for a while (specified quantity) to the periphery side. A laser diode (LD) is considered as one at the following step S3, focusing search is started, and the voltage of an actuator coil is made to increase. Subsequently, the digital value acquired by carrying out the A/D conversion of the voltage of sum signal SA by step S4 is read one by one, and it stores in a predetermined A/D conversion register one by one.

[0033]It is judged at Step S5 whether as compared with the predetermined value Q, sum signal SA is larger than the predetermined value Q in the voltage of sum signal SA. If it is YES, it is judged whether the edge of sum signal SA was detected at Step S6. If it is NO at Step S6, it returns to step S4. When the edge of sum signal SA is detected at Step S6, the one count C of a counter is **********ed at Step S7, and it returns to step S4. On the other hand When the edge of sum signal SA is not detected at Step S6, it is judged at Step S8 whether HFDET of the circuit of drawing 11 is H. It returns to step S4 at the time of NO, and if it is YES, it is judged whether the edge of focus error signal FE was detected by step S9. Waveform of drawing 9 to which, as for this edge, focus error signal FE is set to L from H It is at the time of SC shown in 9-e.

[0034]If the edge of focus error signal FE is detected, it will be judged at Step S10 whether the count C is 1, If it is 1, the disk with which it is loaded will judge that it is CD, will set a parameter suitable for CD at Step S11, and, subsequently will consider focus servo control as one at Step S16. When it is not C= 1, it judges whether it is C= 2 at Step S12, if it is 2, it will judge that it is a disk of one layer of DVD, and a parameter suitable for it is set at Step S13, and, subsequently focus servo control is considered as one at Step S16. When it is not C= 2, it judges whether it is C= 3 at Step S14, if it is 3, it will judge that it is the 1st layer of the two-layer disk of DVD, and a parameter suitable for it is set at Step S15, and, subsequently focus servo control is considered as one at Step S16. The timing which considers focus servo control as one is a waveform of drawing 9. It becomes a time of SC shown in 9-e. It is because the relation of the timing from which the number

of the peaks of sum signal SA obtained in focusing search as shown in drawing 8, and the high frequency component in an EFM signal are detected has a fixed relation according to the kind of disk that the kind of disk can be judged with the number of the counts C.
[0035]Detection of the disk of the write once type from which the level of sum signal SA differs according to the difference in reflectance, and record / playback type is also attained by preparing two or more thresholds of the comparator which binary-izes sum signal SA with each above-mentioned composition. The above-mentioned explanation of operation is a thing at the time of applying to CD only for playback, and one-layer type DVD.
[0036]Tracking servo control is carried out to the next of Step S16 with one at Step S17, and, subsequently tracking balance is adjusted at Step S18. Subsequently, a sector address is read at Step S19, and the light spot of an optical pickup is moved to read in area at Step S20. In Step S21, it is judged whether lead-in groove data and BCA data were reproduced. When these data cannot be found, it goes to Step S25 and reproduction motion is started.
[0037]On the other hand, light spot is moved to BCA, reading an address at Step S22, if Step S21 is YES. At this time, as drawing 2 explained, the bar code of BCA is provided ranging over two or more tracks, but. If it tries to read a bar code to a circumferencial direction along with the end from the outside of a radial inner side or the outside of each black bar currently elongated to the radial direction of a disk, the data of a bar code may be unable to be correctly read with the eccentricity of a disk, etc. Then, a bar code is read along the track near the center of the radial direction of two or more tracks. So that light spot may read a bar code along the track near the center of two or more tracks with which the bar code was recorded at Step S22, One reads an address from the portion 75 with the existing sector 76 at at least 1 round shown in drawing 2, it jumps and (kick) moves to the track near a center, and tracking servo control is performed after that.
[0038]Subsequently, an address is read at Step S23, the bar code (it is called the BCA code or a BCA signal) of BCA is read in a head in prescribed area, and it reads over 1 round of the track of a disk at least. Here, when there is an added bar code, the bar code added with a certain bar code is also read in the time of manufacture. This is because the newest actual condition of the disk can be judged correctly by reading all the contents of the both sides of a certain bar code and the added bar code in the beginning.
[0039]The regenerative data reproduced from the BCA code at the following step S24 is distinguished. Namely, the user specification information, rental information, area designation information which were recorded on BCA, Language specification information, use specification information, estimated usable period specification information, the number-of-times specification information of usable, Usable player specification information, resolution specification information, layer specification information, owner-of-a-copyright information, If there are copyright number information, manufacturing date information, maker information, sales day information, information storing, seller information, product user information, use number information, operating set number information, etc., they will be decoded and it will send to the microcomputer of the system controller 7. Based on the information read from these BCA(s), a microcomputer determines the mode of reproduction, such as permission of the selective reproduction in two or more programs, at Step S25, is in tolerance level and starts reproduction motion that reproduction motion should be performed based on the directions from a user. Read-out of the BCA code is performed about the both sides of prima starred area and postscript area, and when there is a matter which disagrees with both information, it gives priority to the information on the postscript area recorded later in time.
[0040]In the above-mentioned example, after judging whether sum signal SA is larger than the predetermined value Q, judge whether HFDET of the circuit of drawing 11 is H, judge whether subsequently the edge of focus error signal FE was detected, and are considering focus servo control as one, but. The time of starting focusing search without judging whether sum signal SA is larger than the predetermined value Q, Namely, since the impressed electromotive force of a forker

coil begins to increase, HFDET of the circuit of drawing 11 is monitored, Waveform of drawing 9 from which the edge of focus error signal FE was subsequently detected by setting HFDET to H It may constitute so that focus servo control may be considered as one at the time of SC shown in 9-e.

[0041]Drawing 12 is a block diagram showing other examples of the circuit which detects high frequency component HF using an EFM signal among the output signal of the circuit of drawing 6. An EFM signal is given to the comparator 60 via HPF58, and is compared with the reference signal Ref. The output of the comparator 60 is given as a clock of D-FF62, and the Q output is outputted as the detecting signal HFDET. The predetermined value is always given to D input of D-FF62. Reset is a reset signal of D-FF62. The circuit of drawing 12 extracts high frequency component HF of an EFM signal, and latches the signal acquired in this as compared with the reference signal Ref. If a high frequency component is detected besides the circuit of drawing 11 and drawing 12, it is possible to use other composition, for example, HPF can be provided in the input part of the counter portion of drawing 11.

[0042]The circuit of drawing 12 is used instead of the circuit of drawing 11, and the operation at the time of combining with drawing 6 is explained. Since the impressed electromotive force of the time of starting focusing search, i.e., a forker coil, begins to increase, Binary-signal 9-d of drawing 9 obtained in sum signal SA ** as compared with the predetermined value is monitored, Waveform of drawing 9 from which the edge of focus error signal FE was subsequently detected by setting this signal to H, and monitoring HFDET of the circuit of drawing 12 and setting HFDET to H Focus servo control is considered as one at the time of SC shown in 9-e.

[0043]

[Effect of the Invention]As explained above, according to this invention, besides the main information recorded on the optical disc as light information, . Are known as a recording part by the bar code provided in order to record supplementary information on a part for the inner periphery. Using what is called BCA (burst cutting area), protection of copyright, The optical disk reproducing device which plays the optical disc which has additional functions, such as selective reproduction permission of recorded information, is provided, protection of copyright, etc. are achieved effectively, and, therefore, record to optical recording media, such as computer software and worthy movie software, can be promoted.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]Especially this invention relates to the optical disk reproducing device with which supplementary information other than main information plays the optical disc currently recorded as a bar code.

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PRIOR ART

[Description of the Prior Art]In the conventional CD and especially CD-ROM, it is possible for physical restriction not to be provided by many except for legal restriction about read-out or re-recording of record data, to repeat all the data, to play, once an optical recording medium comes to hand, or to carry out re-recording to other recording media. In the optical disc for games, as a special WOBBU ring bit is formed in the most-inner-circumference part of an optical recording portion and it can play only with the playback machine of exclusive use [a special code], copyright protection is planned.

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EFFECT OF THE INVENTION

[Effect of the Invention]As explained above, according to this invention, besides the main information recorded on the optical disc as light information, . Are known as a recording part by the bar code provided in order to record supplementary information on a part for the inner periphery. Using what is called BCA (burst cutting area), protection of copyright, The optical disk reproducing device which plays the optical disc which has additional functions, such as selective reproduction permission of recorded information, is provided, protection of copyright, etc. are achieved effectively, and, therefore, record to optical recording media, such as computer software and worthy movie software, can be promoted.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]By the way, when the storage density of an optical recording medium becomes high and data compression technology progresses, It is possible to be able to record now very a lot of data, and to record about 4.7 GB of data on the disk of one sheet, for example with DVD (digital videodisc: digital versatile disc). Various information, including a sound, a still picture, an animation, a game program, a computer program, etc., is recorded on an optical recording medium by what is called multimedia-ization, and is provided by it.
[0004]However, the policy for enabling copyright protection of the record data of an optical recording medium, reproduction of record data, and alternative permission of re-recording was not fully taken until now. In the technique of limiting to playback by an exclusive player like the disk for games, it cannot be said that it is inconvenient from the field of use of an optical recording medium, and suitable for DVD or DVD-ROM. Therefore, record to the optical recording medium of the information and data in which the record data of an optical recording medium has protection value indefinitely since re-recording will be carried out, reproduction and may waver.
[0005]Therefore, besides the main information by which this invention was recorded on the optical disc as light information, . Are known as a recording part by the bar code provided in order to record supplementary information on the inner circumference portion of an optical disc. It aims at providing the optical disk reproducing device which plays the optical disc which has additional functions, such as protection of copyright, and selective reproduction permission of recorded information, using what is called BCA (burst cutting area).

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MEANS

[Means for Solving the Problem]In order to attain the above-mentioned purpose, this invention provides an optical disk reproducing device which has the composition of following (1) and (2).
(1) Optical recording of the main information is carried out along a track of a concentric circle or spiral shape, And supplementary information is recorded on an optical recording portion divided into two or more sectors of two or more tracks near the most inner circumference of said track as a bar code in piles, And said bar code sees from a center of rotation of an optical disc, and it is arranged in an annular portion covering 360 degrees, And said optical disc arranged among said two or more sectors in said annular portion by portion except at least one sector is irradiated with an optical beam, A means to be an optical disk reproducing device which detects the catoptric light or transmitted light, and to move an optical beam to a focusing direction, A means to distinguish a kind of said optical disc from a signal acquired by optical beam during said movement, A means to set a parameter according to a kind of said optical disc from said discriminated result, a means to judge existence of said bar code, and when there is said bar code, An optical disk reproducing device by which it is characterized [which has a means to move an optical beam to a record section of said bar code, a means which reads said bar code, and a means to perform reproduction of said main information according to said supplementary information currently recorded as said bar code].
(2) Optical recording of the main information is carried out along a track of a concentric circle or spiral shape, And supplementary information is recorded on an optical recording portion divided into two or more sectors of two or more tracks near the most inner circumference of said track as a bar code in piles, And said bar code sees from a center of rotation of an optical disc, and it is arranged in an annular portion covering 360 degrees, And said optical disc arranged among said two or more sectors in said annular portion by portion except at least one sector is irradiated with an optical beam, A means which is an optical disk reproducing device which detects the catoptric light or transmitted light, and reads an address from said sector, An optical disk reproducing device having a means which reads said supplementary information using said address, and a means to reproduce selectively information by which a reproducing permission is carried out among said main information according to said supplementary information.
[0007]
[Embodiment of the Invention]Hereafter, with reference to drawings, it explains with an example desirable about an embodiment of the invention. Drawing 1 is a schematic plan view of an optical recording medium. Drawing 2 is a figure showing the head part and tail part of BCA9 provided in the optical recording medium. BCA9 is provided in the most-inner-circumference part 1S of the optical recording portion 1R of the optical disc 1 as an optical recording medium. In the inside 8A, 8B, 8C, 8D, and 8E of a figure, five tracks of spiral shape or concentric circle shape established in the most-inner-circumference part 1S of the optical disc 1 are shown. these five tracks -- vertical -- namely, the optical disc 1 -- radially -- and each bar of BCA9 is provided so that these five tracks may be crossed. Five or more BCA9 can be actually provided, for example over tens of tracks. When the

optical disc 1 is manufactured [9 / BCA], after the track of the optical recording portion 1R is formed in La Stampa, Ranging over two or more tracks of the most-inner-circumference part 1S of a track, burn off the reflection film of a disk selectively by high output laser, such as an YAG laser, and it removes, A bar code is formed in the circumferencial direction of an optical disc, and it is also called burst cutting area or PCA (post cutting area). BCA9 differs from the track of the usual optical recording at the point which can record respectively peculiar information about every sheet of the disk manufactured by Stamping in large quantities. As data volume, it is about 180 bytes in 1 round.
[0008]the portion 72-1 shown black in drawing 2, 72-2, and 72-3 ... is the portion from which the reflection film of the optical disc was removed -- the portion 74-1 between these, 74-2, and 74-3 ... is a portion from which the reflection film is not removed. the portion 72-1 from which this reflection film was removed, 72-2, and 72-3 -- the portion 74-1 which calls ... a black bar portion and from which the reflection film is not removed, 74-2, and 74-3 ... is called white bar. The pitch of the black bars which adjoin each other along with the circumferencial direction (longitudinal direction shown by an arrow among drawing 2) of a track is 1T, 2T, or 3T. 1T is the circumferencial direction length of one sector, and if it sees about 1 round near most-inner-circumference part 1S of the optical recording portion 1R of the optical disc 1, the portion 75 in which the black bar is not provided exists covering a length of one or more sectors. In each of two or more tracks in which a bar code is provided, this is for being left behind in a form with at least one perfect sector 76, and reproducing an address and a synchronized signal from there. Although the field in which a black bar is not provided is minimum 1 sector, in order to be exact decoding of an address, it is desirable to exist by 16 sectors which constitute 1 ECC block.
[0009]Drawing 3 shows one mode of the optical recording medium with which BCA is provided in two fields, respectively. Among these, as for one BCA, a bar code is provided at the time of manufacture of the optical disc 1, and other one is for a user to record an after-purchase bar code for the optical disc 1. Namely, the 1st bar code 77 sees from the center of rotation of the optical disc 1, and it is arranged in the 1st annular portion 78 covering 360 degrees, the [and] -- being arranged among two or more sectors in the 1 annular portion 78 by the portion except at least one sector 76A -- further -- the -- the [which has at least one sector 76B for newly adding the 2nd bar code 79 to the radial inside or outside of the 1 annular portion 78] -- there are the 2 annular portions 80.
[0010]BCA in this 1st annular portion 78 is provided at the time of manufacture of the optical disc 1, and is prima starred (preformat) area. On the other hand, the area where the bar code of the 2nd annular portion 80 is recorded is postscript area. Although the state where the bar code 79 was already recorded on the postscript area of the 2nd annular portion 80 is shown by drawing 3, since the bar code 79 is not recorded at the time of manufacture, it is not a black bar of the 2nd annular portion 80 at this time. When it sees in the direction of signal regeneration of the optical disc shown in drawing 3 by an arrow, it is a desirable mode that the bar code 77 is arranged from immediately after at least one sector 76A of the 1st annular portion 78.
[0011]Drawing 4 shows other modes of the optical recording medium with which two BCA(s) as prima starred area and postscript area are provided in two fields, respectively. Namely, it is arranged by the portion 82 to which the 1st bar code 81 saw from the center of rotation of an optical disc, and the annular portion covering 360 degrees was restricted, And the inside of the sector of the plurality [bar code / this / 81 / 1st] in an annular portion, When it is arranged by the portion except at least two sectors 76C and 76D and sees to a circumferencial direction, the two sectors 76C, It is arranged between 76D and has the postscript portion 84 for newly adding the 2nd bar code 83 to the portion except the 1st bar code 81 and at least two sectors 76C and 76D among the annular portion further.When it sees in the direction of signal regeneration of the optical disc shown in drawing 4 by an arrow, it is a desirable mode that the bar code 81 is arranged from immediately after [of the two sectors 76C and 76D] one.
[0012]Various information is recordable on two BCA(s) shown in BCA, drawing 3, or drawing 4

shown in drawing 2. That is, one or more of user specification information, rental information, area designation information, language specification information, use specification information, estimated usable period specification information, the number-of-times specification information of usable, usable player specification information, resolution specification information, and layer specification information are recordable as a bar code. One or more of owner-of-a-copyright information, copyright number information, manufacturing date information, maker information, sales day information, information storing, seller information, product user information, use number information, and operating set number information are recordable on these BCA(s) as a bar code.

[0013]It is provided, recorded BCA, i.e., the prima starred area, like drawing 2, and control in an optical disk reproducing device is performed by the above-mentioned information recorded at the time of manufacture when there was no postscript area. On the other hand, in the case of the optical recording medium which has postscript area in addition to prima starred area, it can use as follows. Now, 100 game software for computers shall be beforehand recorded noting that an optical disc is DVD. Among these, those who purchased this DVD shall use only ten software unconditionally, and only after the 90 remaining software pays a predetermined fee, it shall be used for it. In order to permit use on condition of the payment of this fee, a DVD buyer pays a fee for software [there is a predetermined bar code writing device after purchasing DVD, for example] to go to shop fronts, such as a convenience store, and use, and has a predetermined bar code recorded on postscript area after that.

[0014]When the royalty which paid the fee and which receives soft is granted and a user reproduces that DVD with his own DVD player by record of the predetermined bar code to this postscript area, the software which was not able to be enjoyed can be enjoyed before fee payment. That is, an optical disk reproducing device reads the bar code recorded on postscript area in the agency which paid the fee, and reproductive permission is given. Although the above-mentioned explanation explained the case where soft use was only permitted by the payment of a fee, according to the contents of the above-mentioned recorded information, such as the expiration date, a use count, and language specification, various restrictions can be added to the mode at the time of reproduction, or it can perform selection.

[0015]Next, the optical disk reproducing device of this invention which reproduces the above mentioned optical recording medium is explained. Drawing 5 is a block diagram showing one example of the optical disk reproducing device of this invention. This optical disk reproducing device plays CD and DVD to only for [playback] type information, and a two-layer [only for playback] type thing, a write once type thing, and a record reproduction type thing are contained as a DVD. Drawing 6 is a circuit diagram showing the arithmetic unit (some preamplifiers of drawing 5) which answers the optical pickup (PU) and output signal in drawing 5, and shows the example of a circuit which chooses one side of two kinds of tracking error signals according to the discriminated result of the kind of disk.

[0016]In drawing 5, control is performed by Motor Driver / tracking focus control circuit 4 so that the disk 1 may rotate by CLV (constant linear velocity) by the spindle (SP) motor 3 at the time of ordinary reproduction. The signal read by the optical pickup (optical head) 2 from the disk 1 is supplied to the preamplifier 5, and the output signal is given to the digital-servo control circuit 6. The system controller 7 performs transfer of the preamplifier part 5 and the digital-servo control circuit 6, and a signal, and controls the whole optical disk reproducing device. The output signal of the digital-servo control circuit (DSV) 6 is supplied to Motor Driver / tracking focus control circuit 4, and performs the roll control of the spindle motor 3, tracking servo control of an optical pickup, and focus servo control. DSV6 also has a function which sends out a regenerative signal other than a servo control circuit using the memory of a graphic display abbreviation including an adjustable-speed controller / memory controller / EFM demodulator circuit / error correction circuit. The disk 1 of the optical pickup 2 is movable radially at the traverse motor of a graphic display abbreviation, It is movable to the direction to which an object lens was along a focusing direction, i.e., an optical

path, with the focus servo control mechanism and tracking-servo-control mechanism of a graphic display abbreviation, and the radial direction of a disk.
[0017]The optical pickup 2 has again a laser diode which irradiates the disk 1 with a laser beam, Output the signal which played the optical information recorded on the disk 1 based on the catoptric light, or, Two kinds of signals E and F for tracking error signal detection, signal A-D and the 3 beam method, which are the objects for focus error signal FE detection by astigmatic method as shown in drawing 6, and are also the objects for tracking error signal detection by a phase contrast method are outputted. These signals are supplied to the preamplifier 5 and a required operation is performed.
[0018]Drawing 6 shows the arithmetic unit which indicates typically the optical pickups 1 which have the photosensor portions E and F used for the 3 beam method to be the quadrisection photosensor portion A, B, and C and D, and answers the output signal from those photosensor portions. Numerals A-F shows the both sides of these photosensor portion and its output signal. The adding machine 10 of each other is added and outputs the output signal of the photosensor portions A and C on a diagonal line, the output signal of the photosensor portions B and D on other diagonal lines is added mutually, and the adding machine 12 outputs it. The adding machine 14 adds the output signals of the adding machines 10 and 12, and both the subtractors 16 and 20 subtract the output signal of the adding machine 12 from the output signal of the adding machine 10. The subtractor 18 subtracts the output signal of the photosensor portion F from the output signal of the photosensor portion E. It rises with the falling pulse generating circuit 32 which answers the output signal of the adding machine 14, and the pulse generating circuit 34 is formed, and the gate circuits 36 and 40 controlled by these output signals, respectively carry out the gate of the output signal of the subtractor 16, and are given to the hold circuits 38 and 42, respectively. The output signal of the hold circuits 38 and 42 is given to + of the subtractor 44, and - input terminal, respectively, and the output signal of the subtractor 44 is given to 1 side-edge child of the switch 30. The output signal of the adding machine 14 is outputted as a sum signal (SA), an EFM signal, or an EFM plus signal respectively via LPF28 and the equalizer (EQ) 46, respectively. The output signal of the subtractor 18 is given to 0 side-edge child of the switch 30. Selected tracking error signal TE is outputted from the output terminal of the switch 30.
[0019]The control signal CONT given to the switch 30 controls the switch 30, chooses one side of the two input signals, and it is generated by the microcomputer of the system controller 7 so that it may mention later. The output signal of the subtractor 20 is given to a well-known focus servo control system so that it may be used as a focus error signal FE. Sum signal SA which is an output signal of LPF28 serves as a measuring object signal for the below-mentioned disk kind distinction while being a main signal for reading the recorded information on a disk. LPF28 is used in order to remove the high frequency component which may be contained in sum signal SA. Focus error signal FE is used for well-known focus servo control.
[0020]The system controller 7 distinguishes a disk kind by operation which the microcomputer (microcomputer) of a graphic display abbreviation mentions later. Although two kinds of tracking error signals can be switched by the result of the disk kind distinction by this invention and the 3 beam method and a phase contrast method can be properly used by CD with low storage density, and a disk with high storage density, The microcomputer in the system controller 7 generates the control signal CONT according to the kind of disk 1. That is, if it is judged that it is CD with low storage density, that the tracking error signal of the 3 beam method should be chosen, the switch 30 of drawing 6 will be connected to 0 sides, and the output signal of the subtractor 18 will be outputted. On the other hand, if storage density is judged to be a high disk, that the tracking error signal of a phase contrast method should be chosen, the switch 30 will be connected to 1 side and the output signal of LPF28 will be outputted.
[0021]Next, the thing of the two foci type as the optical pickup 2, i.e., JP,7-65407,A, The technique of distinguishing the kind of disk is explained using that whose correspondence on the disk which

provides two convergent points in an object lens as shown in JP,7-98431,A, and with which thickness differs was enabled. At a spot (NA=0.38mm and NA=0.6mm), the optical pickup 2 shall read information from two kinds of disks, i.e., board thickness t1=1.2mm CD, and t2=0.6mm DVD. The distance between 2 foci shall be 0.3 mm. Since the abnormal conditions in a low frequency wave and the influence of offset will be received as influence of a disk surface if image formation is carried out simultaneously in a disk surface and a signal surface, the interval between 2 foci cannot be set up like the thickness of a disk.

[0022]Drawing 7 is a figure showing the condensing state of the laser beam to the disk 1 in this 2 focus type optical pickup. As for a t2=0.6mm disk and 1-c, one layer shows the condensing state to the two-layer type disk (interlaminar distance t3=40micrometer) which is 0.6 mm, the beam of the precedence upper part is an object for 1.2 mm, and the beam of the backward bottom of 1-a is [a t1=1.2mm disk and 1-b] an object for 0.6 mm. alpha, beta, gamma, and delta show each state where the object lens of the optical pickup 2 moved to the focusing direction, among drawing 7. Drawing 8 shows various signal wave forms obtained from an output signal when focusing search is performed by the optical pickup 2 corresponding to drawing 7. That is, the vertical axis of drawing 4 is voltage, a horizontal axis is time and p shows the peak. Since 2 focus type optical pickup comprises a hologram lens, a signal is detected like JP,7-98431,A besides two spots of two foci, but signals other than 2 focus detection signals are omitted here.

[0023]Drawing 8 8-a - 8-d are drawing 7. To the disk of 1-a, 8-e - 8-h are drawing 7. To the disk of 1-b, 8-i - 8-l are drawing 7. The disk of 1-c is supported, respectively. Sum signal SA of drawing 6 is drawing 8. They are 8-a, 8-e, and 8-i, Focus error signal FE is drawing 8. They are 8-b, 8-f, and 8j, The signal acquired as a result of comparing sum signal SA with the threshold shown by a dotted line furthermore is drawing 8. The signal which were 8-c, 8-g, and 8-k, and was acquired as a result of comparing focus error signal FE with the threshold shown by a dotted line further is drawing 4. They are 8-d, 8-h, and 8-l.

[0024]By increasing or decreasing the voltage impressed to the focus coil of the optical pickup 2, focusing search is performed by making the object lens which is a part of optical system of the optical pickup 2 move in accordance with an optical path. Waveform of drawing 8 In 8-a, the peak of the left-hand side in a figure is drawing 7. It is obtained in the state of alpha of the disk of 1-a, and, similarly a right-hand side peak is acquired in the state of beta. Thus, the peak in drawing 4 corresponds to alpha of drawing 7, and beta, and is a waveform. Four peaks in 8-i - 8-l are drawing 7. alpha of the disk of 1-c, beta, gamma, and delta are supported. The portion which is crowded with thin lines among drawing 8 shows high frequency component HF.

[0025]According to the kind of disk distinguished so that it might mention later, the laser power of an optical head, The gain of the circuit which generates the focus error signal and tracking error signal in the preamplifier 5, A required parameter is set among items, such as the change of the characteristic of parameters, such as offset and balance, and the preamplifier 5 or the equalizer 46 in DSV6, i.e., the delaying amount of the unit delay element of the transversal filter which constitutes the equalizer 46, and tap gain setting.

[0026]The transversal filter which constitutes the equalizer 46 is a thing of structure as shown in drawing 10. The time delay T and the tap gains G0-G4 of the unit delay element which constitutes a transversal filter are controllable using the data beforehand memorized to program ROM of the controller of a graphic display abbreviation according to the kind of disk. In the case of 1.2-mm CD, in the case of 0.6-mm DVD, as an example of T, two for T= 80 ns can be switched for T= 440 ns. It is referred to as case G2=1 of 1.2-mm CD, G1=G3=0.12, and G0=G4=0 as an example of G0-G4, It is referred to as case G0=0.02 of 0.6-mm DVD, G1=0.2, G2=1, G3=0.2, and G4=0.02, and further, at the time of focusing search, in order to remove a frequency characteristic, it is made into G2=1, and it sets others to 0.

[0027]Drawing 9 is a wave form chart showing the focusing search in a two-layer disk, and shows the case where servo control is considered as one by the two-layer eye of a 0.6-mm disk. In drawing

9, 9-a is focus coil impressed electromotive force, and 9-b Sum signal SA, 9-c A ** focus error signal, the signal with which 9-d was obtained in sum signal SA as compared with the threshold, 9-e is a focus error signal. The signal acquired in 9-C as compared with the predetermined threshold, the signal with which 9-f is obtained by the comparator 50 in an EFM signal as compared with the reference value Ref, and 9-g are HFDET(s) (output signal of D-FF56) of drawing 11. Waveform Timing SC in 9-e shows the time of considering focus servo control as one.

[0028]Drawing 11 is a block diagram showing an example of a circuit which detects high frequency component HF using sum signal SA and an EFM signal among the output signal of the circuit of drawing 6. An EFM signal is given to the comparator 50 and compared with the reference signal Ref. Sum signal SA is given to D input of D-FF(flip-flop) 52, the Q output is given to D input of D-FF54 of the next step, the Q output is further given to D input of D-FF56 of the next step, and the Q output is outputted as the detecting signal HFDET. The output signal of the comparator 50 is given as a clock of each D-FF 52-56. Reset is a reset signal of each D-FF 52-56.

[0029]The output signal of the comparator 50 in the circuit of drawing 11, i.e., the signal after comparison of an EFM signal, is drawing 9. It is shown as 9-f. Signal which D-FF 52-56 shaped sum signal SA in waveform, and was made Only when 9-d is H (high-level), the pulse of the output signal of the comparator 50 is counted, and if it counts three times, in this example, output signal HFDET 9-g of D-FF56 will be set to H. When it cannot count three times within this section, the counter which consists of D-FF 52-56 is reset by sum signal SA etc. Although it is considered as three counts in this example, this count number can be suitably made into the predetermined number of times.

[0030]Operation of composition of having combined drawing 6 and drawing 11 is explained. The spindle (SP) motor 3 is started after powering on of playback equipment, etc., and focusing search is started. That is, it is drawing 9 about the impressed electromotive force to a focus coil. It is made to increase little by little, as shown in 9-a, and the A/D conversion of the sum signal SA is carried out, it incorporates into a microcomputer, sum signal SA (9-b of drawing 9) is read, and the output signal HFDET of drawing 11 (9-g of drawing 9) is supervised simultaneously.

[0031]Signal acquired in comparison with a focus error signal (9-c of drawing 9), and a predetermined value by sum signal SA's exceeding a predetermined value, and setting the signal HFDET to H 9-e is supervised, focus servo control is considered as one by t (what is called an S curve in focusing search -- almost equivalent to a zero crossing point) the time of this being set to L (low level) from H. Many parameters of the playback equipment by the difference in the reflectance of each disk, for example, laser power of an optical head, The gain of the circuit which generates a focus error signal and a tracking error signal, offset, balance, the time delay of a unit delay element, a tap gain, etc. are set up, and regeneration is performed.

[0032]The operation is explained about the example of the above-mentioned optical disk reproducing device with the flow chart which comprises drawing 13 and drawing 14. When the power supply of playback equipment is switched on, it is exchanged in a disk or the data reproduction of other layers is called for by two or more layer type disk, this flow shall start. It initializes clearing the predetermined contents of the memory of a graphic display abbreviation and buffer which are first connected to the microcomputer etc. at Step S1, subsequently a spindle motor motor is started at Step S2, and an optical pickup (PU) is moved to the most inner circumference of a disk. Then, an optical pickup is moved for a while (specified quantity) to the periphery side. A laser diode (LD) is considered as one at the following step S3, focusing search is started, and the voltage of an actuator coil is made to increase. Subsequently, the digital value acquired by carrying out the A/D conversion of the voltage of sum signal SA by step S4 is read one by one, and it stores in a predetermined A/D conversion register one by one.

[0033]It is judged at Step S5 whether as compared with the predetermined value Q, sum signal SA is larger than the predetermined value Q in the voltage of sum signal SA. If it is YES, it is judged whether the edge of sum signal SA was detected at Step S6. If it is NO at Step S6, it returns to

step S4. When the edge of sum signal SA is detected at Step S6, the one count C of a counter is **********ed at Step S7, and it returns to step S4. On the other hand When the edge of sum signal SA is not detected at Step S6, it is judged at Step S8 whether HFDET of the circuit of drawing 11 is H. It returns to step S4 at the time of NO, and if it is YES, it is judged whether the edge of focus error signal FE was detected by step S9. Waveform of drawing 9 to which, as for this edge, focus error signal FE is set to L from H It is at the time of SC shown in 9-e.

[0034]If the edge of focus error signal FE is detected, it will be judged at Step S10 whether the count C is 1, If it is 1, the disk with which it is loaded will judge that it is CD, will set a parameter suitable for CD at Step S11, and, subsequently will consider focus servo control as one at Step S16. When it is not C= 1, it judges whether it is C= 2 at Step S12, if it is 2, it will judge that it is a disk of one layer of DVD, and a parameter suitable for it is set at Step S13, and, subsequently focus servo control is considered as one at Step S16. When it is not C= 2, it judges whether it is C= 3 at Step S14, if it is 3, it will judge that it is the 1st layer of the two-layer disk of DVD, and a parameter suitable for it is set at Step S15, and, subsequently focus servo control is considered as one at Step S16. The timing which considers focus servo control as one is a waveform of drawing 9. It becomes a time of SC shown in 9-e. It is because the relation of the timing from which the number of the peaks of sum signal SA obtained in focusing search as shown in drawing 8, and the high frequency component in an EFM signal are detected has a fixed relation according to the kind of disk that the kind of disk can be judged with the number of the counts C.

[0035]Detection of the disk of the write once type from which the level of sum signal SA differs according to the difference in reflectance, and record / playback type is also attained by preparing two or more thresholds of the comparator which binary-izes sum signal SA with each above-mentioned composition. The above-mentioned explanation of operation is a thing at the time of applying to CD only for playback, and one-layer type DVD.

[0036]Tracking servo control is carried out to the next of Step S16 with one at Step S17, and, subsequently tracking balance is adjusted at Step S18. Subsequently, a sector address is read at Step S19, and the light spot of an optical pickup is moved to read in area at Step S20. In Step S21, it is judged whether lead-in groove data and BCA data were reproduced. When these data cannot be found, it goes to Step S25 and reproduction motion is started.

[0037]On the other hand, light spot is moved to BCA, reading an address at Step S22, if Step S21 is YES. At this time, as drawing 2 explained, the bar code of BCA is provided ranging over two or more tracks, but. If it tries to read a bar code to a circumferencial direction along with the end from the outside of a radial inner side or the outside of each black bar currently elongated to the radial direction of a disk, the data of a bar code may be unable to be correctly read with the eccentricity of a disk, etc. Then, a bar code is read along the track near the center of the radial direction of two or more tracks. So that light spot may read a bar code along the track near the center of two or more tracks with which the bar code was recorded at Step S22, One reads an address from the portion 75 with the existing sector 76 at at least 1 round shown in drawing 2, it jumps and (kick) moves to the track near a center, and tracking servo control is performed after that.

[0038]Subsequently, an address is read at Step S23, the bar code (it is called the BCA code or a BCA signal) of BCA is read in a head in prescribed area, and it reads over 1 round of the track of a disk at least. Here, when there is an added bar code, the bar code added with a certain bar code is also read in the time of manufacture. This is because the newest actual condition of the disk can be judged correctly by reading all the contents of the both sides of a certain bar code and the added bar code in the beginning.

[0039]The regenerative data reproduced from the BCA code at the following step S24 is distinguished. Namely, the user specification information, rental information, area designation information which were recorded on BCA, Language specification information, use specification information, estimated usable period specification information, the number-of-times specification information of usable, Usable player specification information, resolution specification information,

layer specification information, owner-of-a-copyright information, If there are copyright number information, manufacturing date information, maker information, sales day information, information storing, seller information, product user information, use number information, operating set number information, etc., they will be decoded and it will send to the microcomputer of the system controller 7. Based on the information read from these BCA(s), a microcomputer determines the mode of reproduction, such as permission of the selective reproduction in two or more programs, at Step S25, is in tolerance level and starts reproduction motion that reproduction motion should be performed based on the directions from a user. Read-out of the BCA code is performed about the both sides of prima starred area and postscript area, and when there is a matter which disagrees with both information, it gives priority to the information on the postscript area recorded later in time.

[0040]In the above-mentioned example, after judging whether sum signal SA is larger than the predetermined value Q, judge whether HFDET of the circuit of drawing 11 is H, judge whether subsequently the edge of focus error signal FE was detected, and are considering focus servo control as one, but. The time of starting focusing search without judging whether sum signal SA is larger than the predetermined value Q, Namely, since the impressed electromotive force of a forker coil begins to increase, HFDET of the circuit of drawing 11 is monitored, Waveform of drawing 9 from which the edge of focus error signal FE was subsequently detected by setting HFDET to H It may constitute so that focus servo control may be considered as one at the time of SC shown in 9-e.

[0041]Drawing 12 is a block diagram showing other examples of the circuit which detects high frequency component HF using an EFM signal among the output signal of the circuit of drawing 6. An EFM signal is given to the comparator 60 via HPF58, and is compared with the reference signal Ref. The output of the comparator 60 is given as a clock of D-FF62, and the Q output is outputted as the detecting signal HFDET. The predetermined value is always given to D input of D-FF62. Reset is a reset signal of D-FF62. The circuit of drawing 12 extracts high frequency component HF of an EFM signal, and latches the signal acquired in this as compared with the reference signal Ref. If a high frequency component is detected besides the circuit of drawing 11 and drawing 12, it is possible to use other composition, for example, HPF can be provided in the input part of the counter portion of drawing 11.

[0042]The circuit of drawing 12 is used instead of the circuit of drawing 11, and the operation at the time of combining with drawing 6 is explained. Since the impressed electromotive force of the time of starting focusing search, i.e., a forker coil, begins to increase, Binary-signal 9-d of drawing 9 obtained in sum signal SA ** as compared with the predetermined value is monitored, Waveform of drawing 9 from which the edge of focus error signal FE was subsequently detected by setting this signal to H, and monitoring HFDET of the circuit of drawing 12 and setting HFDET to H Focus servo control is considered as one at the time of SC shown in 9-e.

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]It is a schematic plan view of an optical recording medium.
[Drawing 2]It is a mimetic diagram showing the composition of BCA of an optical recording medium.
[Drawing 3]It is a mimetic diagram showing other composition of BCA of an optical recording medium.
[Drawing 4]It is a mimetic diagram showing the composition of further others of BCA of an optical recording medium.
[Drawing 5]It is a wave form chart showing the focusing search in a two-layer disk.
[Drawing 6]It is a block diagram showing one example of the optical disk reproducing device of this invention.
[Drawing 7]It is a figure showing the condensing state of the laser beam to the various disks in 2 focus type optical pickup.
[Drawing 8]It is a wave form chart showing the output signal of the optical pickup obtained when focusing search to the various disks of drawing 7 is performed, and the various signals acquired from there.
[Drawing 9]It is a wave form chart showing the timing which judges the kind of disk by focusing search and considers focus servo control as one using the decision result further.
[Drawing 10]It is a block diagram showing the composition of the transversal filter contained in the preamplifier or DSV of drawing 5, and is also a block diagram showing the composition of the transversal filter as an example of a circuit of the equalizer of drawing 6.
[Drawing 11]It is a block diagram showing one example of a circuit which detects high frequency component HF using sum signal SA and an EFM signal among the output signal of the circuit of drawing 6.
[Drawing 12]It is a block diagram showing one example of a circuit which detects high frequency component HF using an EFM signal among the output signal of the circuit of drawing 6.
[Drawing 13]It is in the first half of the flow chart which shows operation of the microcomputer (microcomputer) used for the system controller in drawing 5.
[Drawing 14]It is in the second half of the flow chart which shows operation of the microcomputer (microcomputer) used for the system controller in drawing 5.
[Description of Notations]
1 Optical disc
1R Optical recording portion
1S Most-inner-circumference part
2 Optical pickup
3 Spindle motor
4 Motor Driver / tracking focus control circuit
5 Preamplifier

6 Digital-servo (DSV) control circuit
7 System controller
8A, 8B, 8C, 8D, and 8E Track of a most-inner-circumference part
9 BCA
10, 12, 14, and 22 Adding machine
16, 18, 20, and 44 Subtractor
24 Delay circuit
26 Multiplier
28 LPF (low pass filter)
30 Switch
32, 34 pulse generating circuits
36, 40 gate circuits
38, 42 hold circuits
46 Equalizer
50 and 60 Comparator
52, 54, 56, 62 D-FF
58 HPF (highpass filter)
72-1, 72-2, 72-3 black bar
74-1, 74-2, 74-3 white bar
75 Postscript portion
76, 76A, and 76B Sector
78 The 1st annular portion
80 The 2nd annular portion
A, B, C, and D Quadrisection photosensor portion used for a phase contrast method
Two sensor portions used for the E and F 3 beam method

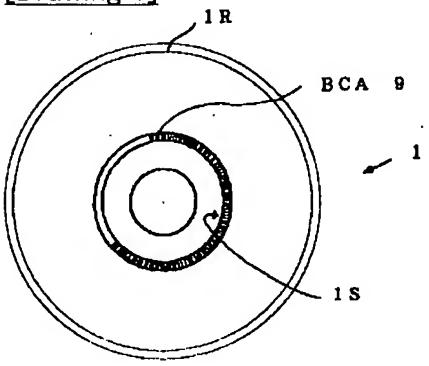
[Translation done.]

* NOTICES *

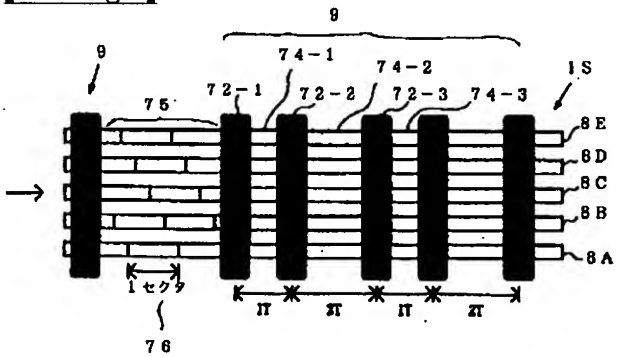
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

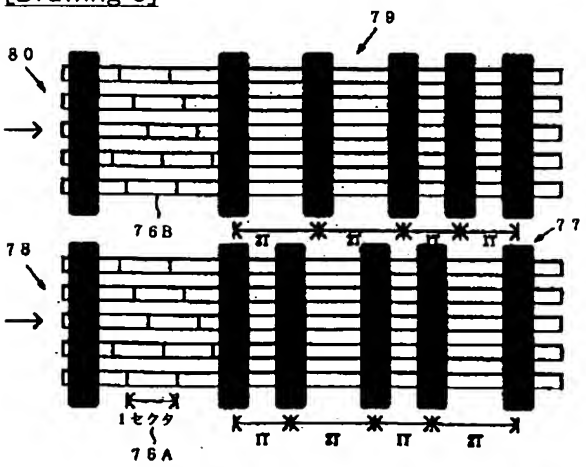
[Drawing 1]



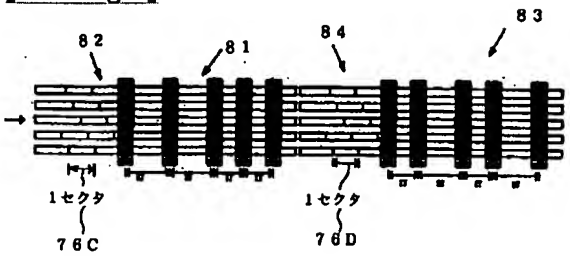
[Drawing 2]



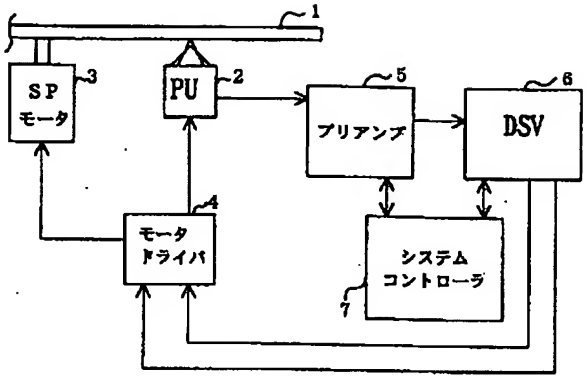
[Drawing 3]



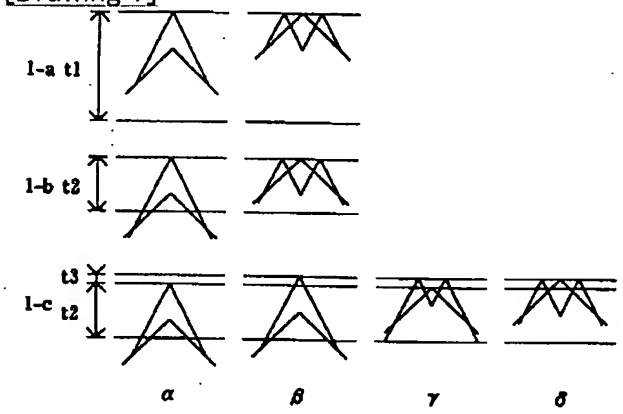
[Drawing 4]



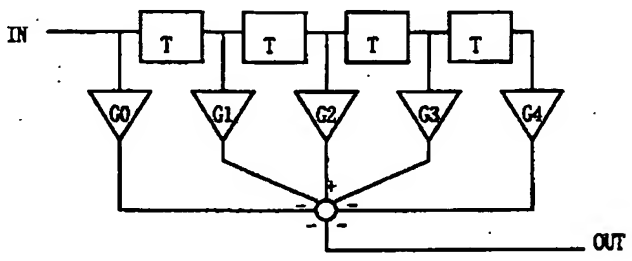
[Drawing 5]



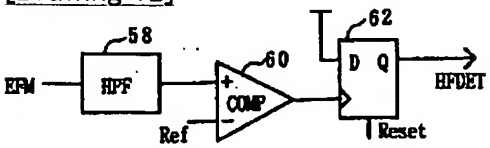
[Drawing 7]



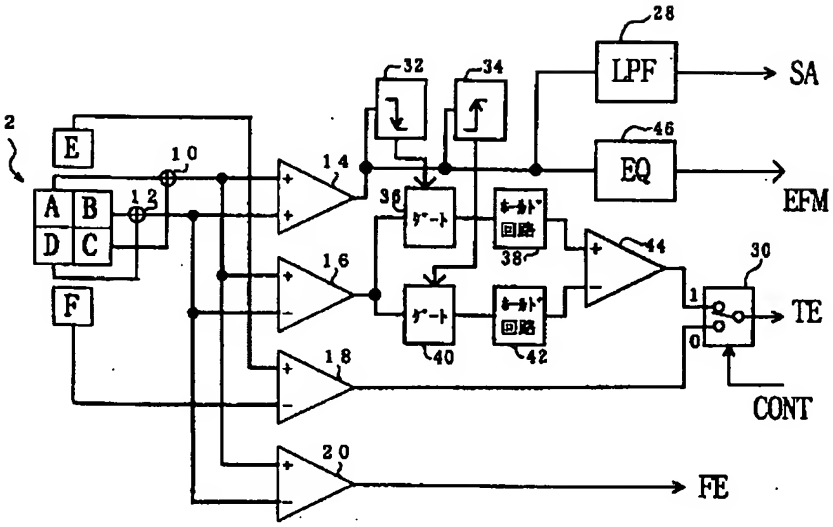
[Drawing 10]



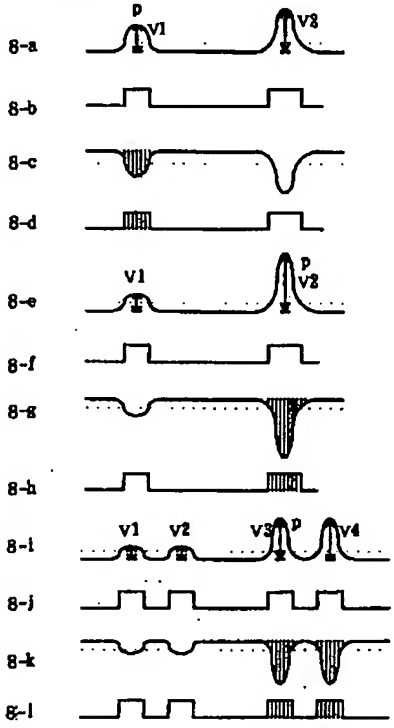
[Drawing 12]



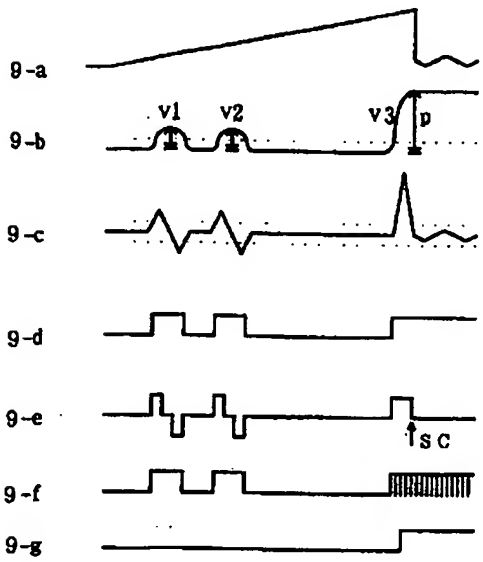
[Drawing 6]



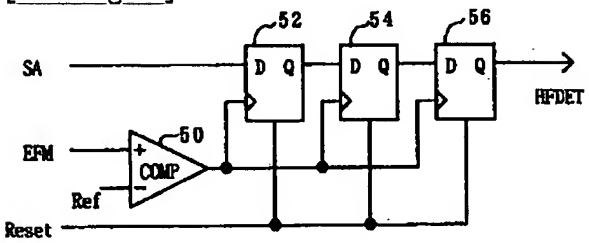
[Drawing 8]



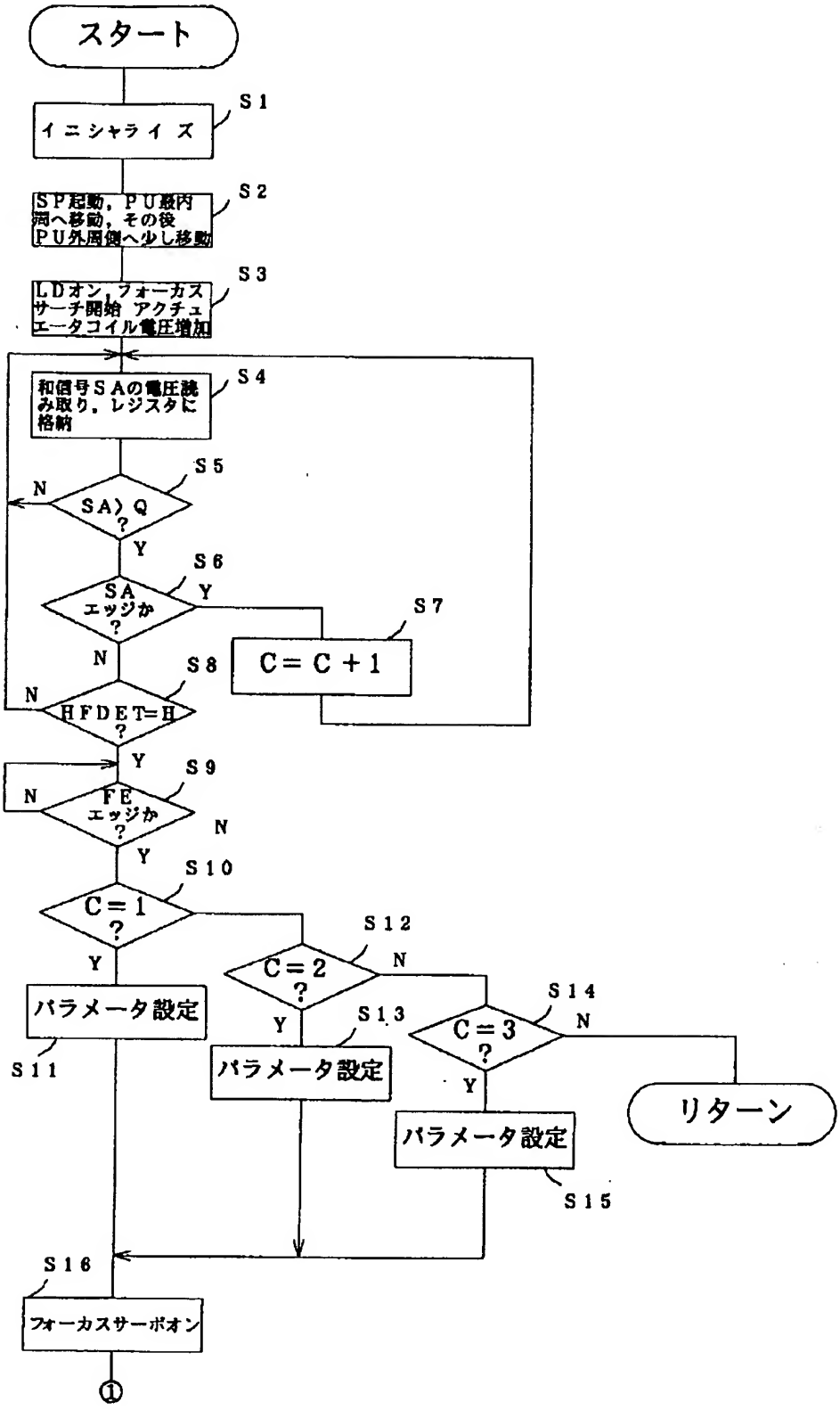
[Drawing 9]



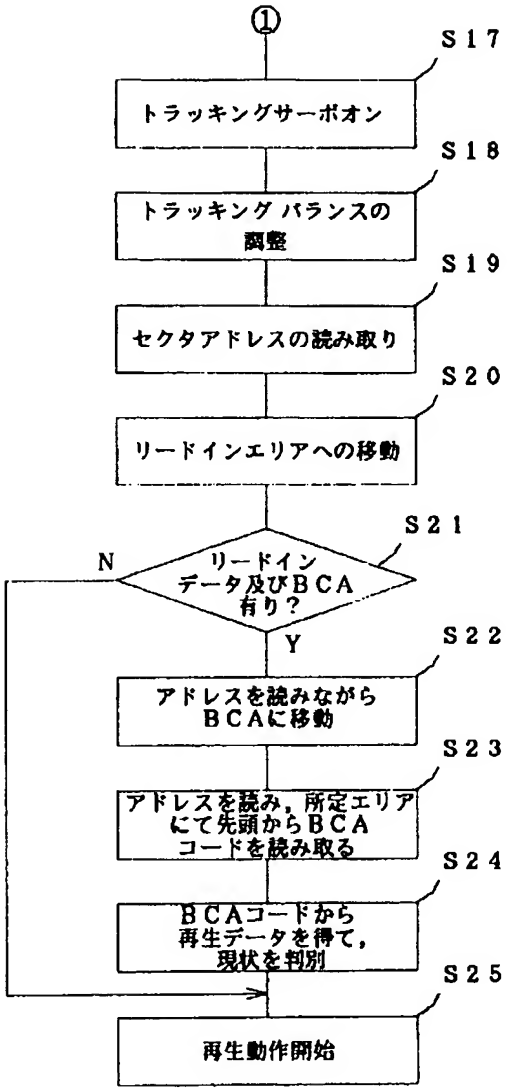
[Drawing 11]



[Drawing 13]


スタート
S1
イニシャライズ
S2
SP起動，PU最内周へ移動，その後PU外周側へ少し移動
S3
LDオン，フォーカスサーチ開始 アクチュエータコイル電圧増加
S4
和信号SAの電圧読み取り，レジスタに格納
S5
SA＞Q ?
N
Y
S6
SA エッジか ?
Y
S7
C＝C＋1
N
S8
HFDET=H ?
N
Y
S9
FE エッジか ?
N
Y
S10
C＝1 ?
Y
S11
パラメータ設定
S12
C＝2 ?
N
Y
S13
パラメータ設定
S14
C＝3 ?
N
Y
S15
パラメータ設定
リターン
S16
フォーカスサーボオン
①

[Drawing 14]



[Translation done.]